19. Design an experimental setup using Powder X-ray Diffraction (XRD) to study the phase transitions in a material under different temperature and pressure conditions.

20. Explain photodynamic therapy in detail, including its mechanism of action, advantages in cancer, treatment and current research trends.

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NOVEMBER/DECEMBER 2024

23PEPH25A — PHYSICS OF NANO SCIENCE AND TECHNOLOGY

Time : Three hours Maximum : 75 marks

Sourashtra Industries Arts & Science College T.V.Malai

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is nano technology?

2. How you can classify nano materials?

3. Define "ductility".

4. What are ferroelectric materials?

5. What is application of Physical Vapour Deposition (PVD)?

6. How does electrochemical deposition work?

7. Write the principle of X-ray PhotoElectron Spectroscopy (XPS).

8. What is the purpose of a vibrating sample magnetometer (VSM)?

9. What are fuel cells, and how do they work?

10. Describe the basic mechanism of water purification using photocatalysis.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Explain the historical development of nanotechnology.

Or

(b) What are 1D, 2D and 0D nanostructures in nanotechnology?

12. (a) How does mechanical properties of material affect when the material becomes nano?

Or

(b) Explain Surface Plasmon Resonance (SPR) and its significance in nanomaterials.

13. (a) What are the key advantages of the sol-gel process in nanomaterial synthesis?

Or

(b) Compare and contrast PVD and CVD in thin film deposition.

14. (a) What are the advantages and limitations of Scanning Tunneling Microscopy (STM)?

Or

(b) Describe the differences between JEM and TEM.

15. (a) What are the key functionalities of nanobots, and how might they transform medical procedure?

Or

(b) Explain how optical nanosensors work and write about their applications.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Evaluate the significance of surface effect in controlling the properties of nano materials.

17. Explain how the physical and optical properties of nano materials are inter connected and influenced by quantum size effects.

18. How does 'Ball milling techniques' used in the preparation of nano particles?

Shanmuga Industries Arts & Science College T.V.Malai